

WHAT IS CLAIMED IS:

1. An harmonic article identification tag, comprising:  
at least one RF diode carried by an article and responsive to at least two RF  
signals to generate a third harmonic intermodulation output.
- 5 2. The harmonic article identification tag as in Claim 1 wherein the at  
least one RF diode comprises a signature identification of the article carrying the at  
least one RF diode.
- 10 3. The harmonic article identification tag as in Claim 1 wherein the at  
least one diode generates harmonic signal characteristics for RF article identification.
- 15 4. The harmonic article identification tag as in Claim 1 wherein the at  
least one diode responds to RF signals in a frequency range from about 24.0 GHz to  
about 24.1 GHz.

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5        5.        An harmonic article identification system, comprising:  
         at least one semiconductor device carried by an article and responsive to at  
         least two RF signals to generate an harmonic intermodulation output;  
         an antenna receiving an harmonic intermodulation output and generating an  
         analyzer signal; and  
         a signal analyzer coupled to the antenna and responsive to the analyzer signal  
         to identify the article carrying the at least one semiconductor device.

10        6.        The harmonic article identification system as in Claim 5 wherein the at  
         least one semiconductor device comprises at least one RF diode.

15        7.        The harmonic article identification system as in Claim 6 wherein the at  
         least one diode responds to RF signals in a frequency range from about 24.0 GHz to  
         about 24.1 GHz.

         8.        The harmonic article identification system as in Claim 5 wherein the  
         antenna comprises a dipole having a length of one wavelength at one of the at least  
         two RF signals.

20        9.        The harmonic article identification system as in Claim 5 wherein the at  
         least one semiconductor device comprises a signature identification of the article  
         carrying the at least one semiconductor device.

10. An harmonic article identification system, comprising:  
a first signal generator operating to generate an RF signal at a first frequency;  
a second signal generator operating to generate an RF signal at a second frequency;

5 at least one RF diode carried by an article and responsive to the first and second frequencies to generate an harmonic intermodulation output;

an antenna receiving the harmonic intermodulation output and generating an analyzer signal; and

10 a signal analyzer coupled to the antenna and responsive to the analyzer signal to identify the article carrying the at least one RF diode.

11. The harmonic article identification system as in Claim 10 wherein the signal analyzer responds to the analyzer signal by subtraction of the first frequency signal from the second frequency signal.

12. The harmonic article identification system as in Claim 10 wherein the signal analyzer responds to the analyzer signal in accordance with the expression:

$2F_1 - F_2,$

wherein:

20  $F_1$  equals the first frequency, and

$F_2$  equals the second frequency.

13. The harmonic article identification system as in Claim 10 wherein the signal analyzer responds to the analyzer signal by subtraction of the second frequency signal from the first frequency signal.

14. The harmonic article identification system as in Claim 10 wherein the signal analyzer responds to the analyzer signal in accordance with the expression:

$2F_2 - F_1,$

30 wherein:

$F_1$  is the first frequency, and

$F_2$  is the second frequency.

15. The harmonic article identification system as in Claim 10 wherein the at least one RF diode comprises a signature identification of the article carrying the at least one RF diode.

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16. The harmonic article identification system as in Claim 10 wherein the at least one RF diode responds to RF signals in a frequency range from about 24.0 GHz to about 24.1 GHz.

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17. The harmonic article identification system as in Claim 10 wherein the antenna comprises a dipole having a wavelength determined by either the first frequency or the second frequency.

18. A method for harmonic article identification, comprising:  
generating at least two RF signals at separate frequencies;  
generating an harmonic intermodulation signal by at least one RF diode  
carried by an article and responsive to the at least two RF signals;  
5 generating an analyzer signal from an antenna receiving the third harmonic  
intermodulation output; and  
generating an article identification signature by analyzing the analyzer signal  
from the antenna.

10 19. The method for harmonic article identification as in Claim 18 further  
comprising storing the article signature for subsequent identification of the article.

20. The method for harmonic article identification as in Claim 19 further  
comprising scanning the stored article signatures for identification of an article.

15 21. The method for harmonic article identification as in Claim 20 further  
comprising generating an article identification in response to scanning the stored  
article signatures.

22. An harmonic article identification system, comprising:
- a first signal generator outputting an RF signal at a frequency of 24.0 GHZ;
  - a second signal generator outputting an RF signal at a frequency of 24.1 GHZ;
  - at least one RF diode carried by an article and responsive to the 24.0 GHZ
- 5 frequency and the 24.1 GHZ frequency to generate a third harmonic intermodulation output;
- a dipole antenna receiving the third harmonic intermodulation output and generating an analyzer signal; and
  - a signal analyzer coupled to the dipole antenna and responsive to the analyzer
- 10 signal to identify the article carrying the at least one RF diode in accordance with the expression:
- $$2F1 - F2,$$
- wherein:
- F1 equals the 24.0 GHZ frequency, and
  - 15 F2 equals the 24.1 GHZ frequency.

23. An harmonic article identification system, comprising:  
a first signal generator outputting an RF signal at a frequency of 24.0 GHZ;  
a second signal generator outputting an RF signal at a frequency of 24.1 GHZ;  
at least one RF diode carried by an article and responsive to the 24.0 GHZ  
5 frequency and the 24.1 GHZ frequency to generate a third harmonic intermodulation  
output;  
a dipole antenna receiving or any other tuned antenna receiving the third RF  
harmonic intermodulation output and generating an analyzer signal; and  
a signal analyzer coupled to the dipole antenna and responsive to the analyzer  
10 signal to identify the article carrying the at least one RF diode in accordance with the  
expression:  
$$2F_2 - F_1,$$
  
wherein:  
$$F_1 \text{ equals the } 24.0 \text{ GHZ frequency, and}$$
  
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$$F_2 \text{ equals the } 24.1 \text{ GHZ frequency.}$$

24. An identification system for articles carrying at least one semiconductor device generating an harmonic intermodulation output, comprising:

a spectrum analyzer responsive to an harmonic intermodulation output generated by at least one semiconductor device carried by an article, the spectrum  
5 analyzer generating an identification signal;

a signature memory storing the identification signatures of at least one article for identification;

a comparator responsive to the identification signal of the spectrum analyzer and coupled to receive the identification signatures of at least one article for  
10 identification from the signature memory, the comparator generating an output identifying an article carrying at least one semiconductor device from the stored identification signatures.

25. An identification system as in Claim 24 further comprising an antenna  
15 receiving the harmonic intermodulation output generated by the at least one semiconductor device carried by an article and generating an analyzer signal, the spectrum analyzer responsive to the analyzer signal to generate the identification signal.

26. The identification system as in Claim 25 wherein the antenna  
20 comprises a dipole having a length of one wavelength at one of at least two RF signals.

27. The identification system as in Claim 24 further comprising a display  
25 responsive to the signal generated by the comparator to indicate identification of an article.

28. The identification system as in Claim 24 further comprising:  
a first signal generator operating to generate an RF signal at a first frequency;  
30 a second signal generator operating to generate an RF signal at a second frequency signal; and



wherein the at least one semiconductor device carried by the article responds to the first and second frequencies to generate the harmonic intermodulation output.

29. The identification system as in Claim 28 further comprising an antenna  
5 receiving the harmonic intermodulation output from the article carrying the at least one semiconductor device and generating an analyzer signal; and

wherein the spectrum analyzer responds to the analyzer signal to generate an identification signal.

10 30. The identification system as in Claim 29 wherein the antenna comprises a dipole having a length of one wavelength at either the first frequency or the second frequency.

31. A method for harmonic article identification, comprising:  
generating at least two RF signals at separate frequencies;  
radiating at least one semiconductor device carried by an article for  
identification;

5 generating an harmonic intermodulation signal by the at least one  
semiconductor device carried by the article and radiated with the at least two RF  
signals;

generating an analyzer signal from an antenna receiving the harmonic  
intermodulation output;

10 comparing the analyzer signal with one or more stored identification  
signatures, the comparator generating a signal to identify the article carrying the at  
least one semiconductor device from the stored identification signatures.

32. The method for harmonic article identification as in Claim 31 further  
15 comprising storing the identification signatures for subsequent comparison with  
analyzer signals.

33. The method for harmonic article identification as in Claim 32 wherein  
comparing the analyzer signal with identification signatures comprises:

20 scanning the stored signatures for comparison with the generated analyzer  
signal; and

generating an article identification signal in response to a comparison between  
one of the stored identification signatures and the analyzer signal.

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